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EXAMINER	
CHANG, AUDREY Y	

ART UNIT	PAPER NUMBER
2872	

DATE MAILED: 11/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/842,935	KOZHUKH, MICHAEL	
	Examiner	Art Unit	
	Audrey Y. Chang	2872	

-- The MAILING DATE of this communication appears on th cover sh et with the correspond nce address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,8-11,13,16,17 and 23-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,8-11,13,16,17 and 23-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Remark

- This Office Action is in response to applicant's amendment filed on September 25, 2003, which has been entered as paper number 13.
- By this amendment, the applicant has amended claims 8, 16, and 24 and has canceled claims 4-6, 12 and 19.
- Claims 1-3, 8-11, 13, 16-17, and 23-30 remain pending in this application.
- The objection of claim 24 set forth in the previous office Action is withdrawn in response to applicant's amendment.

Claim Objections

1. **Claims 9 is objected to because of the following informalities:**

(1) The phrase "depositing a silver on a semiconductor" recited in claim 9 is confusing and indefinite since it is not clear how does the "semiconductor" relate to other layers recited in the based claim. **Appropriate correction is required.**

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. **Claims 1-3, and 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Li et al (PN. 5,619,059) in view of the patent issued to Oyama et al (PN. 6,572,990).**

Li et al teaches a *color deformable mirror device* (10) having a plurality of electronically controlled *micro-mirrors* that each is comprised of a *mirror element* (16, Figure 1) with a color mirror (34). The color mirror (34) is comprised of a mirror *substrate* (22), which can be made of *semiconductor material such as silicon*, (please see column 6, lines 41-43), and *an optical thin film interference color coating* (24), *serves as the absorbing layer*, formed on top of the mirror substrate, wherein a high reflectance *silver layer* (26) is ***directly*** formed on top of the silicon mirror substrate as shown in Figure 1, (please see column 6, lines 44-50).

Li et al further teaches that the optical thin film interference *color coating layer* (24), having multilayer structure design, is capable of enhancing reflection and *absorption* of light incident upon the coating, (please see column 6, lines 15-40) and in particularly it includes *absorbing layers* (30 and 32, please see column 5, lines 49-51) and *transparent layer* (28) that can be formed by layer materials such as *silicon dioxide* and *silicon nitride* dielectric materials, (please see column 6, lines 55-58). The interference coating including the absorbing layers are formed over the silver layer such that the interference coating is designed to reflect red, blue or green color of light. It is implicitly true that the interference coating is also absorbing color of light that is not intended for reflection which implicitly including the *absorption of blue light*, (please see Figures 1 and 2, columns 5-6). The method of forming the color deformable mirror device is in implicitly included.

This reference has met all the limitations of the claims with the exception that it does not teach explicitly that the layer thickness for the absorbing layer components in the interference coating is between 700 to 750 Angstroms. However Li et al does teach that by varying the thickness of the layers in the interference coating different reflection characteristics and implicitly different absorption characteristics, in order to obtain optimum performance, can be achieved, (please see column 6, lines 27-36). Furthermore, **Oyama** et al in the same field of endeavor teaches *an absorbing layer* that is comprised of a transparent nitride film, which includes *silicon nitride*, with a thickness ranged between 40

to 80 nm or 400 to 800 angstroms and an oxide film consisting essentially *silicon dioxide* film with a thickness of between 70 to 140 nm or 700 to 1400 angstroms, (column 4 lines 23-47, column 6 lines 36-40). It would then have been obvious to one skilled in the art to apply the teachings of Oyama et al to modify the interference coating of Li et al to include the layer materials of silicon dioxide and silicon nitride with the thickness taught for the benefit of obtaining desired absorbing property for the interference coating.

With regard to claim 17, Li et al teaches that the color mirrors (34) in the deformable mirror device (DMD) are *micro-mirrors* that each can be switched on or off by driving electronics, (please see Figures 1-2).

4. Claims 8-10 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Li et al in view of the patent issued to Iacovangelo et al (PN. 6,587,263).

Li et al teaches a *color deformable mirror device* (10) having a plurality of electronically controlled *micro-mirrors* that each is comprised of a *mirror element* (16, Figure 1) with a color mirror (34). The color mirror (34) is comprised of a mirror *substrate* (22), which can be made of *semiconductor material such as silicon*, (please see column 6, lines 41-43), and *an optical thin film interference color coating* (24), *serves as the absorbing layer*, formed on top of the mirror substrate, wherein a high reflectance *silver layer* (26) is ***directly*** formed on top of the silicon mirror substrate as shown in Figure 1, (please see column 6, lines 44-50).

Li et al further teaches that the optical thin film interference *color coating layer* (24), having multilayer structure design, is capable of enhancing reflection and *absorption* of light incident upon the coating, (please see column 6, lines 15-40) and in particularly it includes *absorbing layers* (30 and 32, please see column 5, lines 49-51) and *transparent layer* (28) that can be formed by layer materials such as *silicon dioxide* and *silicon nitride* dielectric materials, (please see column 6, lines 55-58). The

interference coating including the absorbing layers are formed over the silver layer such that the interference coating is designed to reflect red, blue or green color of light. It is implicitly true that the interference coating is also absorbing color of light that is not intended for reflection which implicitly including the absorption of blue light, (please see Figures 1 and 2, columns 5-6). The method of forming the color deformable mirror device is in implicitly included.

With regard to claims 10 and 13, Li et al teaches that the thin film interference coating (24), serves as the absorbing layer include two different insulator materials, (please see column 6, lines 41-62). It is understood in the art that an *interference* coating essentially comprises alternative material layers having different refractive indices. These materials layers are formed by *chemical vapor deposition method*, (please see column 9).

This reference however does not teach explicitly that the interference coating or the absorbing layer is formed at a temperature of less than 250^0 C. But chemical vapor deposition method is a extremely well known method in the art for forming thin film layer the temperature specifics are therefore either inherently included in the disclosure of Li et al or an obvious modification to one skilled in the art. Furthermore, **Iacovangelo** et al in the same field of endeavor teach a thin film layer includes silicon oxide and silicon nitride layer can be deposited using chemical vapor deposition method at a temperature of less than 250^0 C, (please see column 4, liens 51-56 and table B). It would then have been obvious to one skilled in the art to modify the deposition method to make the deposition at a temperature of less than 250^0 C for the benefit of minimize thermal expansion mismatch problem.

5. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Li et al in view of the patent issued to Iacovangelo et al as applied to claim 8 above, and further in view of the patent issued to Hosokawa et al (PN. 6,284,393).

The color deformable mirror device taught by **Li** et al in combination with the teachings of **Iacovangelo** et al as described for claim 8 above have met all the limitations of the claim with the exception that it does not teach explicitly that the reflective silver layer is deposited at 50 ^{0}C. However using low temperature deposition process to deposit silver layer is very well known in the art as demonstrated by the teachings of **Hosokawa** et al wherein a reflective silver layer is sputtered at a **room temperature** (which is generally understood to be between 20 to 25 ^{0}C) (please see column 23, lines 9-14). It would then have been obvious to one skilled in the art to apply the teachings of Hosokawa et al to form the silver layer at room temperature for the benefit of providing a conventional process for depositing the silver layer to reduce manufacturing cost.

6. **Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over the patents issued to Li et al and Oyama et al as applied to claim 16 above, and further in view of the patent issued to Hosokawa et al.**

The color deformable mirror device taught by **Li** et al in view of the teachings of **Oyama** et al as described for claim 16 above have met all the limitations of the claim with the exception that they do not teach explicitly that the silver layer is formed at a temperature below 50^0 C. However using low temperature deposition process to deposit silver layer is very well known in the art as demonstrated by the teachings of **Hosokawa** et al wherein a reflective silver layer is sputtered at **a room temperature** (which is generally understood to be between 20 to 25 ^{0}C) (please see column 23, lines 9-14). It would then have been obvious to one skilled in the art to apply the teachings of Hosokawa et al to form the silver layer at room temperature for the benefit of providing a conventional process for depositing the silver layer for the benefit of save cost for manufacture.

7. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Li et al in view of the patent issued to Oyama et al as applied to claim 16 above, and further in view of the patent issued to Iacovangelo et al.

The color deformable mirror device taught by **Li** et al in view of the teachings of **Oyama** et al as described for claim 16 above have met all the limitations of the claim with the exception that they do not teach explicitly that the absorbing layer or the interference coating is formed at a temperature below 250^0 C. However chemical vapor deposition method is a extremely well known method in the art for forming thin film layer the temperature specifics are therefore either inherently included in the disclosure of Li et al or an obvious modification to one skilled in the art. Furthermore, **Iacovangelo** et al in the same field of endeavor teach thin film layers including silicon oxide and silicon nitride layer can be deposited using chemical vapor deposition method at a temperature of less than 250^0 C, (please see column 4, liens 51-56 and table B). It would then have been obvious to one skilled in the art to modify the deposition method to make the deposition at a temperature of less than 250^0 C for the benefit of minimize thermal expansion mismatch problem.

8. Claims 25-26 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over the paten issued to Li et al in view of the patent issued to Hosokawa et al.

Li et al teaches a *color deformable mirror device* (10) having a plurality of electronically controlled *micro-mirrors* that each is comprised of a *mirror element* (16, Figure 1) with a color mirror (34). The color mirror (34) is comprised of a mirror *substrate* (22), which can be made of semiconductor material such as silicon, (please see column 6, lines 41-43), and *an optical thin film interference color coating* (24), serves as absorbing layer, formed on top of the mirror substrate, wherein a high reflectance silver layer (26) is ***directly*** formed on top of the silicon mirror substrate as shown in Figure 1, (please see column 6, lines 44-50).

Li et al further teaches that the optical thin film interference *color coating layer* (24), having multilayer structure design, is capable of enhancing reflection and *absorption* of light incident upon the coating, (please see column 6, lines 15-40) and in particularly it includes *absorbing layers* (30 and 32, please see column 5, lines 49-51) and *transparent layer* (28) that can be formed by layer materials such as *silicon dioxide* and *silicon nitride* dielectric materials, (please see column 6, lines 55-58). The interference coating including the absorbing layers are formed over the silver layer such that the interference coating is designed to reflect red, blue or green color of light. It is implicitly true that the interference coating is also absorbing color of light that is not intended for reflection which implicitly including the absorption of blue light, (please see Figures 1 and 2, columns 5-6). The method of forming the color deformable mirror device is in implicitly included.

This reference has met all the limitations of the claim with the exception that it does not teaches explicitly that the silver layer is formed at temperature below 50 degree Celsius. However using low temperature deposition process to deposit silver layer is very well known in the art as demonstrated by the teachings of **Hosokawa** et al wherein a reflective silver layer is sputtered at a room temperature (which is generally understood to be between 20 to 25 ^{0}C) (please see column 23, lines 9-14). It would then have been obvious to one skilled in the art to apply the teachings of Hosokawa et al to form the silver layer at room temperature for the benefit of providing a conventional process for depositing the silver layer for the benefit of save cost for manufacture.

9. **Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Li et al and Hosokawa et al as applied to claim 25 above, and further in view of the patent issued to Iacovangelo et al.**

The color deformable mirror with color absorbing interference coating deposited on a silver reflective layer taught by **Li** et al in combination with teachings of **Hosokawa** et al as described for claim

25 above has met all the limitations of the claim. Li et al teaches that the interference coating is formed by using *chemical vapor deposition process* (CVD) but it does not teach explicitly about the temperature used, (please see column 9). However chemical vapor deposition method is a extremely well known method in the art for forming thin film layer the temperature specifics are therefore either inherently included in the disclosure of Li et al or an obvious modification to one skilled in the art. Furthermore, **Iacovangelo** et al in the same field of endeavor teach thin film layers including silicon oxide and silicon nitride layer can be deposited using chemical vapor deposition method at a temperature of less than 250^0 C, (please see column 4, liens 51-56 and table B). It would then have been obvious to one skilled in the art to modify the deposition method to make the deposition at a temperature of less than 250^0 C for the benefit of minimize thermal expansion mismatch problem.

10. **Claims 29-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Li et al and Hosokawa et al as applied to claim 25 above, and further in view the patent issued to Oyama et al**

The deformable mirror taught by Li et al in combination with the teachings of Hosokawa et al as described for claim 25 above have met all the limitations of the claims. These references have met all the limitations of the claims with the exception that it does not teach explicitly that the layer thickness for the absorbing layer components in the interference coating is between 700 to 750 Angstroms. However Li et al does teach that by varying the thickness of the transparent layers in the interference coating different reflection characteristics and implicitly different absorption characteristics, which in order to obtain optimum performance, can be achieved, (please see column 6, lines 27-36). Furthermore, **Oyama** et al in the same field of endeavor teaches an absorbing layer that is comprised of a transparent nitride film, which includes silicon nitride, with a thickness ranged between 40 to 80 nm or 400 to 800 angstroms and an oxide film consisting essentially silicon dioxide film with a thickness of between 70 to 140 nm or 700

to 1400 angstroms, (column 4 lines 23-47, column 6 lines 36-40). It would then have been obvious to one skilled in the art to apply the teachings of Oyama et al to modify the interference coating of Li et al to include the layer materials of silicon dioxide and silicon nitride with the thickness taught for the benefit of obtaining desired absorbing property for the interference coating.

With regard to claim 30, Li et al teaches that the interference coating is formed by using *chemical vapor deposition process* (CVD).

Response to Arguments

11. Applicant's arguments filed on September 25, 2003 have been fully considered but they are not persuasive. The newly amended claims have been addressed and rejected for the reasons stated above.

12. In response to applicant's argument which states that the cited Oyama et al reference does not teach that the filter absorbs blue light, the examiner respectfully disagrees for the reasons stated below. Both the Li et al reference and the Oyama et al reference *teach* that the coating or film *absorb blue light* since as shown in the spectrum figures, (for both references), the coating or film (in the wavelength range of 455 to 492 nm) has non-zero or none 100% reflectance. It is well known in the art that by energy conservation law the sum of reflectance, transmittance and absorptance equals to 1 or 100%. The coating or the film therefore certainly absorbs blue light as disclosed by the filter spectrum.

13. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., small grain sizes achieved in the deposition process) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Audrey Y. Chang whose telephone number is 703-305-6208. The examiner can normally be reached on Monday-Friday (8:00-4:30), alternative Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on 703-305-0024. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Audrey Y. Chang
Primary Examiner
Art Unit 2872

A. Chang, Ph.D.